An Exploratory Study of Sensemaking of Historical Information

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ABSTRACT

There are many ways of documenting and making sense of the past. Contemporary museums are attempting to facilitate these processes by creating online as well as in-museum experiences for visitors. Whether they encounter the past via physical or digital artefacts, visitors often reflect the values and interests of the communities to which they belong. Museums have a growing interest in gathering additional 'crowdsourced' historical information through the experiences they design; experiences that are likely to contrast these communities. Online and in-museum visitor experiences are different but could reflect an engagement with the past in complementary ways, depending on how visitors make sense of them. We report an exploratory study of sensemaking by museum visitors as they encountered a set of digital historical images in a military museum. Based on Dervin's approach to sensemaking, the images were accompanied by three neutral verbal prompts to encourage thinking about their individual meaning. Visitors were able to spontaneously suggest a wide range of terms to describe their interest in each image but the variety was notably greater when the first in the set was of an individual airman in a state of repose, rather than of a group of personnel in a social setting. Our study raises a number of questions about the relationship between the navigation of museum visitors through digital artefacts and the design of support for their journeys.

We argue that anchoring an experience on a direct relationship with a personal image could have particular significance for sensemaking processes that could engage visitors with a more nuanced understanding of the past. It may be that direct relationships of this kind are able to bridge differences of understanding between the communities to which visitors belong.

Categories and Subject Descriptors

H.5 [**Information interfaces and presentation**]; H.5.3 [**Group and Organization Interfaces**]: Asynchronous interaction, Collaborative computing

Keywords

Sensemaking, social navigation, narrative, museums, heritage[1]

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`https://culturalheritagecommunities.wordpress.com/`

1. INTRODUCTION

Many museums are taking steps to open their collections to the public online. The motivations for this are varied but raise new questions about how people make connections with the historical past. On the one hand, visitors are presented with forms of artefact other than the tangible content of a physical museum exhibition. On the other, the digitization of the past brings with it the potential to explore and see the connectedness of museum items that support new forms of sense making for visitors. The idea of a 'visitor', in this context, is similarly taking on a new significance to museums beyond that of the paying observer, referring to a range of interests and degrees of engagement with the past.

1.1 Human-Computer Interaction Design for Museums

Prior research in interaction design in museums has primarily focused on the creation of in gallery guides or kiosks[3] or user experience with the physical space [1, 6], such as support for navigating from room to room. Our research focuses on the museum as an entity with which visitors interact and which is manifest to visitors *both as digital and physical structures for organising and integrating historical information.* We conceptualise the cognitive and social engagement with the museum as a matter of individual and collective sense-making of the historical information hosted by the museum.

1.2 Sensemaking in HCI

Sensemaking is a term used to describe the cognitive processes involved in searching for and finding meaning in information [5]. Pirolli and Card provide an broad description of the sensemaking process used in intelligence analysis [4]. The sensemaking model they suggest is made up of two loops; a foraging loop where data is filtered and organised and a sensemaking loop where a representational schema of the data is iteratively developed to form an understanding of the data.

Museum visitors all operate in the same information space but they navigate through and make sense of the information in different ways due to the influence of their own past experiences, knowledge and biases. Pirolli and Card's model is primarily concerned with expert users with well defined tasks and goals but there is a need to further explore sensemaking processes in the non-expert members of the online community. Many online and offline museum visitors are non-experts in an unfamiliar learning environment and they are there because they want to make sense of the artefacts.

Dervin uses a gap-bridging metaphor to explore the sense-making process [2]. The gap can be seen as an information need which can be bridged with ideas, memories, beliefs or an emotional response. A person is continuously moving through time and space making and un-making sense by bridging gaps. This metaphor may be useful when exploring how people make sense of historical data; sense can be made in a number of ways and Dervin's metaphor allows for a context-sensitive approach to be made. Looking at how the gaps are bridged in different contexts may unearth what problems people have when sense making and how they deal with them; this may in turn suggest possible solutions.

1.3 Sensemaking in the on- and offline Museum

The research reported in this paper was carried out in collaboration with the American Air Museum (AAM) at the Imperial War Museum in the UK. It focuses on image and mission data available through a web portal [2], incorporating a large online archive of media and information about American airman and civilians in Britain during World War II. The AAM website was created to reach out to interested parties, both to inform and to collect information from people who have interest in these matters. So, much like Wikipedia, it has been designed to accommodate crowdsourced contributions; anyone can upload their own photographs, stories or other information and link it to other appropriate entries.

AAM surveys have shown that there are many different types of user operating on the AAM website; historical researchers, enthusiasts, family historians, museum volunteers and casual visitors. There is an internal community made up of enthusiast maintainers, one-time contributors and casual learners. There are also many forum and Facebook based external communities that use the website content to support their own activities; these are mainly military history communities but there are non-military interests such as digital photography, clothing and model making communities especially interested in the photographic content the website provides. The information space must therefore support all the these users needs concurrently. The goals and activities of users are diverse and at times conflicting; people want to search, receive information and contribute in different ways. It is in the interest of museums, and perhaps other information-rich multiuser websites, to develop tools and mechanisms to support a multitude of information seeking and sensemaking behaviours.

This study makes an initial attempt to unearth potential challenges and opportunities when people try to make sense of historical information. This may in turn inform more in depth future studies as well as point to technologies and tools that can help foster meaningful engagement with the past.

2. METHODOLOGY

Our study was designed to evoke thoughts, feelings and interpretations of AAM images in an attempt to help visitors articulate their meaning. Many hundreds of visitors pass through the physical museum site at Duxford on a daily basis, having demonstrated their interest in its exhibits by paying an entrance fee. So we had reason to believe that visitors to the physical site would have motivation and interest in the digital archive, given the commonality of subject matter. We further believed that the sense and relevance of the digital artefacts would be augmented by experiencing them in the physical museum setting.

2.1 Preparation

Prior to the study taking place, an ethics review was completed which in turn informed the creation of a study briefing and consent form. The subject matter of the AAM covers events that are within the living memory of many visitors. For this reason, it is capable of evoking personal reactions that are rather different to, for example, a museum that archives and curates exhibitions of medieval life. The 'crowdsourcing' motivation of the AAM website owes in part to the oral history potential in its visitors for providing firsthand accounts. Yet the accounts themselves could be personally harrowing, associated with loss and bereavement as well as camaraderie. At the time of the study the potential participants were asked to read, agree to and sign these documents before commencing the study. Participants were verbally given instructions to the tasks and were explicitly reassured that they could terminate their involvement at anytime if they felt they did not want to continue.

2.2 Study Design

The study was conducted over three days at the Imperial War Museums' Duxford site and participants were recruited from passing museum visitors. Two tasks were carried out in each sitting; the photography sensemaking study that this report is primarily concerned with and a user testing study for an gallery interactive. The photography sense-making study was informed by Devin's 'knowledge gap' approach to sense making by asking three open-ended questions about historical images.

2.3 Study Setting

The study took place at Imperial War Museums Duxford within the AirSpace hanger; a building that exhibits numerous aircraft to tell the story of aviation in Britain and the Commonwealth. This context within which this study took place may have had some influence on the data collected. The presence of artifacts and information closely related to the topic being addressed in the study may have influenced the answers that the participants gave.

The building is located right next to the entrance of the museum site and so is usually the first building that visitors enter. If the study had been conducted near the end of the visit there may have been more references to artifacts around the museum in responses to the questions. This could be seen in one participant's answer to Q1 when presented with image A. They had visited the museum in reverse starting with the buildings furthest away from the entrance and then working their way back. The participant talked at length about the jeep in the image because they had just seen and sat in one that was part of an exhibition in another building.

2.4 Study Method

In the sensemaking study, participants were shown three photographs in sequence on a tablet computer. These images depicted different subjects; Image A: an airman on a

[2]http://www.americanairmuseum.com

Figure 1: Image A

Figure 2: Image B

Jeep (Figure 1), Image B: a bombing raid (Figure 2), Image C: A group of airmen and red cross workers eating in a mess hall (Figure 3). These images were taken from the American Air Museum website and were chosen because they each had a clear and distinct subject matter that participants would be able to consider.

Participants were shown the photographs one after the other in a specific order and asked three predefined questions for each image:

Q1: What's going on in this photograph? This question was asked to make sure that the participant had fully considered the photograph and to externalise their initial sensemaking process.

Q2: What more do you want to know about the subjects of the photograph? What other questions spring to mind? This question was asked to uncover the gaps in knowledge that the participant had interest in bridging.

Q3: Can you tag this photograph with descriptive or emotional keywords or phrases? This question was asked to allow the participant to sum up their key thoughts and feelings about the photograph and to provide some indication of what the meaning of the photograph was to them.

3. RESULTS

Figure 3: Image C

Although the study took place over three days it wasn't until the second day that the study methodology was finalised. The first day of the study was used to trial variations of the questions and to gauge how participants reacted. Therefore the data presented in this report is taken only from the participants on the second and third days of the study. In total 12 sessions were run on these days with participants taking part either as individuals or as a pair. One session was terminated due to the negative psychological impact image B had on a participant. Therefore only 11 of the sessions were used for data analysis.

After the first day of the study it was noted that participants would reference previous photographs when describing the current one. It was decided that the order in which the photographs were shown should be changed to reveal if the order in which they were shown had a significant effect on the participants sensemaking process. On the second day of the study the order was kept the same as the original; Image A - Image B - Image C. On the third day this order was reversed. In total there were 5 study sessions on the second day (without the terminated session) and 6 sessions on the third day. The results can be seen in section 3.

If a participant displayed specialist knowledge at any point during the study it was noted. This allowed for the results to be separated in relation to how those with and without existing specialist knowledge interacted with the presented information. Specialist knowledge was displayed if the participant identified a vehicle, rank or any other historical artefact in the photographs. For example, some participants

Table 2: Results from Q2 when participants were encouraged to ask questions about the photographs

Question	#
Where are they?	9
Aircraft type?	3
When?	3
Which country are the planes from?	3
What are they bombing?	2
Are they bombs or parachutes?	1
How many people came back?	1

correctly identified the aircraft in image B as B-24 Liberators. Most of this identification behaviour was in response to Q1 as the participants described the image.

Participants responses were noted down by the researcher as the study progressed. This section shows the coded results from the three questions that were asked during the study. It should be noted that participants could give as many answers as they thought necessary for each question when interpreting the tallies. The results were coded by the researcher who ran the study.

3.1 Q1: What is going on in this photograph?

The responses in the notes were coded into three categories; *descriptions* for literal observations, *inferences* based on connections between objects or prior knowledge and *questions*. The results are shown in table 1.

3.2 Q2: What more do you want to know about the subjects of the photograph?

The responses for each photograph were tallied and tabulated. Discrepancies between responses that carried the same meaning were added to the same tally. e.g. "Where are they?" and "Where are they flying over?" for image B were seen as the same question. Table 2 shows the results from this question.

3.3 Q3: Can you tag this photograph with keywords or phrases?

The responses from this question have been compiled into two tables to show the two sets of responses; those from the first sequence (table 3) the photographs were shown in and those from the reverse sequence (table 4). Discrepancies between responses that carried the same meaning were added to the same tally. e.g. "mud" and "muddy".

4. ANALYSIS

Analysing the coded results from the study gives us insights into how people make sense of information. The results from Q1 were coded into three categories drawing influence from Dervin's gap-bridge metaphor; *descriptions*, *inferences* and *questions*. *Descriptions* are literal observations where the participant is just saying what they see, e.g. "It's very muddy". The *inference* coding is used when the participants have used prior knowledge or assumptions to make conclusions about something in the photograph; e.g. "They're American planes - they must be over Germany". Connections are being made and bridges are being built by the participant to answer their information needs. The last coding of Q1 is *questions*. When a gap in a participants knowledge cannot be bridged with prior knowledge or the information readily available around them a question is formed that will close that gap, e.g. "What type of plane is that?".

Question 1 required the participant to work out what's going on in the photographs. The second question (Q2) was intended to expose any further questions that the participant had about the photographs. The results from the study (section 3.2) suggest that participants were most interested in *where* the subjects of the photograph were. *When* the photograph was taken was also a major interest. Placing the subjects of the photograph in space/time seems to be an important part of how people make meaning from the image. People have existing knowledge of historical events such as World War II; they may know the places it was fought and the time period. Asking general questions such as *when* and *where* puts the content of the image in context of what is already known.

The more specific questions that were asked were concerned with either identification of people or objects ("What type of plane is that?"), making sense of ambiguous activities (What is he reading?"), or resolving eccentricities in the image ("Why are there woman in the officers mess?"). Understanding why people ask these questions may have consequences for design of information spaces because the questions indicate where a person might navigate to next; providing that they feel that the effort they need to put in to forage for it does not outweigh the perceived value of finding it.

When asked Q2, it was found that those who displayed specialist knowledge were less likely to ask any questions and in some cases no questions were asked at all. These participants were would often give more information about a related topic than ask for more information.

The final question (Q3) asked the participants to tag the images with a few keywords or phrases that they associate with the photograph. This was to get some indication of the participants main thoughts and feelings about the subject of the photograph. In some way these tags may summarise the sense that was made during the previous two questions. It was found that the tags were mostly descriptive ("Jeep", "Mud", "Tea") with only a few being affective ("Terrifying", "Fear"). Affective tagging was almost exclusively used for Image B.

4.1 The Role of Reversal: Cueing Effects on Narrative Expansion in Sensemaking

The sequence in which the images were shown was reversed for half the participants and seems to have had an effect on how the images were tagged. It may be that when making sense of a photograph there are influences from previously viewed photographs impacting the interpretation. The first order of images (Image A $\rightarrow$ Image B $\rightarrow$ Image C) produced many affective tags for image B whereas the reverse order (Image C $\rightarrow$ Image B $\rightarrow$ Image A) produced far fewer affective tags and more descriptive tags. There may be something about viewing image B after A that provoked a more affective response.

The first order also produced some tags for image C that didn't appear with the reverse order; *returned safely* and

Table 1: Example of results from Q1 coded as descriptions, inferences and questions

Description	Inferences	Questions
It's Muddy	Must be England because of the mud	What's in his hand?
Serviceman holding a cup of tea	He's stuck in the mud	Is he reading a letter?
He's reading	It's probably a letter from home	Is it winter of Autumn?
His boots are undone	He probably think the coffee is awful	Is he reading orders?
Relaxing	He's a US serviceman	

Table 3: Tagging results from Q3 in first order: Image A → Image B → Image C

Image A		**Image B**		**Image C**	
Tag	#	*Tag*	#	*Tag*	#
Jeep	2	Bombing	2	Return Safely	2
Mud	2	Risk	2	Relaxing	2
Tea	2	Worry	2	Special relationship	1
GI	1	Bombs above	1	Before we go	1
American	1	Terrifying	1	Leisure time	1
Cold	1	Awful	1	Band of brothers	1
Where now?	1	People on ground	1		
Sad time	1	Supplies	1		
		Fear	1		
		D-Day	1		
		WWII	1		

Table 4: Tagging results from Q3 in reverse sequence: Image C → Image B → Image A

Image A		**Image B**		**Image C**	
Tag	#	*Tag*	#	*Tag*	#
Mud	2	Bombing	4	Meal time	2
Jeep	1	Europe	2	Break	2
GI	1	Devastation	1	US	2
Coffee	1	War	1	Social	1
Relaxing	1	Chaotic	1	Mixing	1
Invasion	1			Happy	1
1944	1			Friends	1
D-Day	1			1944	1
Letter from home	1			Bomber crews	1
				Mess hall	1
				Tea	1
				Daily routine	1
				Wartime	1

before we go are tags that describe the image as an event in a narrative. It may be that the participant has a gap in their knowledge as to what the people in image C are doing. After seeing the mission being flown in image B, they are able to fill that gap and explain why the people are there using information from the previous image. In a search for causality the information recently perceived and fresh in the mind may be used.

4.2 A Protocol for Enhancing Sensemaking?

From the Q1 data we can make a primitive outline of processes that participants use for sensemaking:

Information is gathered
: The *descriptions* may be externalisations of this; "There's a man sitting on a jeep", "It's very muddy", "He's reading a letter".

Connections are made
: New information is referenced against prior knowledge and connections between the two are made. "It's very muddy so he might be in England". "He's sitting on the jeep because he's stuck in the mud".

Questions are asked
: When there is a desire to understand (close the knowledge gap) but insufficient information to do so a question is asked. "Who is the letter from?". The processes may not occur in the above order but may be interwoven and iterative. These processes may also provide points at which technologies and tools may be designed to enhance and ease the sensemaking process.

Some assumptions seem to be made so that the information fits into a previously known schema; "Looks like an American GI - There's probably coffee in that cup" and "Probably thinks the coffee here is awful". Preconceived notions may play an important role in how people act on or make-sense-of new information. Stereotyping can be a way of explaining behaviour when there is no further information to explain a situation. The man on the jeep looks American and so may now have a character, back story and coffee preference in the mind of the participant.

5. GENERAL DISCUSSION

In this paper, we have described an exploratory study of sensemaking amongst museum visitors around a small sample of photographs that were selected from within the AAM archive. We argue that visitors implicitly link their interpretations of a given artefact to the thoughts they have had about a predecessor. The information gaps may be bridged using the information that has recently been processed in the participant's mind.

Different member types may interact with the historical information differently depending on their own goals. Some members may be interested in categorising images while others may want to extract a deeper understanding about the image's subject matter. The results from the study suggest that those with specialist knowledge didn't ask questions that those with non-specialist knowledge asked; they were more likely to share their own knowledge than request for more. This may reveal points at which community members may support each other's activity; one set of users may benefit from the desires of others (E.g. non-specialists may benefit from specialists desire to share knowledge). There may be many more instances where community member's needs overlap which could be exploited to promote healthier community activity.

The study has provided insights into sensemaking behaviours that may be pursued and validated in future work. The results of this initial study suggest that people want to place historical information in context to enhance their understanding of it. Making space and time information easily reachable to the user through the design and implementation of sensemaking tools. The design and evaluation of such tools may be pursued in future studies.

Heritage websites need to support many types of users in their online communities, however different user groups interpret and utilise information in different ways depending on their own prior knowledge and goals. Those with existing specialist knowledge don't have the same information needs as non-specialist visitors. Further research is needed to fully understand how each type of visitor's behaviour can be supported within a single system.

Narratives may be suggested in the mind of the user when navigating through historical information especially if the proceeding information seems connected. If this is the case it would be an important aspect for information architects to consider when designing interactions involving historical data. Further research is needed to confirm and fully understand this effect to inform design guide lines for information spaces affected by it.

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